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APPLICATION NUMBER: 60/540,933

FILING DATE: *January 30, 2004*

RELATED PCT APPLICATION NUMBER: *PCT/US05/02539*



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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV355034951US

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)
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TITLE OF THE INVENTION (500 CHARACTERS MAX)		
HIGH PRECISION FEED PARTICULARLY USEFUL FOR UV INK JET PRINTING ON VINYL		
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ENCLOSED APPLICATION PARTS		
<input checked="" type="checkbox"/> SPECIFICATION	NUMBER OF PAGES	10
<input checked="" type="checkbox"/> DRAWING(S)	NUMBER OF SHEETS	2
OTHER (SPECIFY)		
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT		
<input checked="" type="checkbox"/> A check is enclosed to cover the filing fee.	Filing Fee Amount	\$160

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

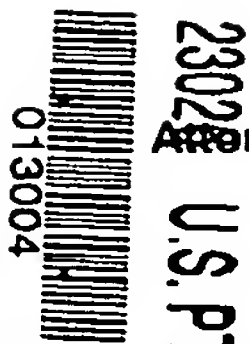
Date: 1/30/04

Attorney Docket No. LPPT-26

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

SEND TO: Box: Provisional Application, Assistant Commissioner for Patents, Washington, DC 20231.



Attorney Docket No. LPPT-26

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Codos et al.

For: HIGH PRECISION FEED PARTICULARLY USEFUL FOR UV INK JET
PRINTING ON VINYL

MS Provisional Patent Application
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

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Date: January 30, 2004

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Provisional Application Cover Sheet
Check in amount of \$160
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Drawings 2 sheet
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HIGH PRECISION FEED PARTICULARLY USEFUL FOR
UV INK JET PRINTING ON VINYL

[0001] This invention relates to ink jet printing, and more particularly, to the longitudinal indexing of a printhead relative to a substrate between transverse scans of the printhead.

Background of the Invention

[0002] The use of ink jet printing in wide format applications is expanding. With such printing, substrate panels or webs are supported relative to a printhead that typically prints by moving transversely relative to the substrate and the support on which the substrate is held to print a row of an image on the substrate. The printhead moves across the substrate support on a bridge that extends transversely across the support, carrying the printhead on a carriage that is moveable on the bridge. Such a row of the image might be formed of a plurality of lines of dots jetted from a plurality of nozzles on the printhead. The complete image is formed by printing a plurality of such rows side by side along a substrate length. Traditionally, there is no relative movement between the printhead and the substrate during the transverse movement of the printhead over the substrate when printing a row of the image. Between the printing of each row of the image, however, the substrate undergoes a longitudinal indexing motion relative to the printhead. This indexing can be carried out by moving the substrate longitudinally on its support or by moving the bridge relative to the support. A printing system that provides both types of longitudinal movement is disclosed in U.S. Patent No. 6,012,403, hereby expressly incorporated by reference herein.

[0003] The relative movement between the printhead and the substrate in the longitudinal direction, that is perpendicular to the transverse row-printing movement of

the printhead, requires that the indexing distance be achieved with sufficient precision to avoid visible artifacts in the printed image caused by tolerances between the lines of dots of adjacent rows. The degree of precision required depends, in addition to the resolution requirements of the particular application, on the nature of the ink being jetted and the physical properties of the substrate. For example, much wide format printing is for posters, banners and signage that is printed onto vinyl substrate webs, either by roll-to-roll or roll-to-sheet processes. Traditionally, these substrates have been printed with solvent-based inks that form dots that spread somewhat on the vinyl substrate before drying. Such dot spread tends to forgive longitudinal feed errors of several thousandths of an inch. Such dot spread, however, limits the resolution of the image being printed and the overall quality of the image.

[0004] Wide format ink jet printing has found advantages in the use of inks that use and require exposure to ultraviolet light for curing (UV inks). Such inks can produce superior images in many applications, can print on some substrates that other inks cannot, and does not have some of the occupational and environmental disadvantages of some other inks. Examples of ink-jet printing with UV ink are described in U.S. Patents Nos. 6,312,123; 6,467,898 and 6,523,921 and in PCT publications WO02/078958 and WO02/18148, hereby expressly incorporated by reference herein.

[0005] In providing its advantages, UV inks have less dot spread, for example, on substrates such as vinyl. Such property of UV inks can provide higher resolution, but might further reveal feed or indexing tolerances between scan rows of the printhead. The human eye, for example, can detect defects of less than 1 mil (i.e., < 0.001 inch). This has created problems with roll-fed substrates, particularly smooth, low-absorbency substrates where dot-spread is minimal.

[0006] Web fed printers are particularly prone to longitudinal feed errors that have been difficult to control. Cumulative tolerances in the drive linkages, potential slippage of the substrate on the rollers, and other mechanical limitations have produced errors that are difficult to predict. Attempts to improve indexing precision between the printhead and the substrate have focused on feed controls. The use of an encoder, for example, to measure the actual feed of the substrate relative to the printhead bridge, has been attempted. The use of an encoder in a closed loop control of the substrate feed drive has been only moderately successful because of a lack of stiffness in the loop. The

use of an encoder to read the results of an indexing step and feeding the result back to the control to make a subsequent correction has presented other problems.

[0007] When a feed system controller receives an error signal after a feed step is made, additional time is consumed in making a correction. Further, the correction step is also prone to error, which can require a still further corrective move. In addition, the error can indicate that the substrate has been fed too far, requiring a negative correction step, or a backward move of the web. Not all machines are capable of executing reverse moves of a substrate web, and many of those that can reverse the substrate feed cannot do so accurately or efficiently. As a result, deliberately under-feeding the web has been tried. This increases the likelihood that a correction is needed and increases the overall likely number of corrections that must be made. As a result of these difficulties, high quality ink-jet printing with UV ink onto smooth substrates is not realized in most applications where the above problems are presented.

[0008] Accordingly, there is a need for a way to increase precision in the longitudinal feeding of substrates, particularly smooth substrates such as vinyl, and particularly when printing with UV inks.

Summary of the Invention

[0009] A primary objective of the present invention is to provide for increased precision in the imparting of relative movement of a substrate relative to the transverse path of an ink-jet printhead.

[0010] According to the principles of the present invention, a compound feed system imparts relative movement of a substrate relative to the transverse path of an ink-jet printhead.

[0011] These and other objectives and advantages of the present invention will be more readily apparent from the following detailed description.

Brief Description of the Drawings

[0012] Fig. 1 is a perspective diagram of an ink-jet printing system of the prior art.

[0013] Fig. 2 is a perspective diagram, similar to Fig. 1, illustrating an embodiment of an ink-jet printing system embodying principles of the present invention.

[0014] Fig. 3 is a perspective diagram, similar to Fig. 2, illustrating an alternative embodiment of an ink-jet printing system embodying principles of the present invention.

Detailed Description

[0015] In Fig. 1, an ink-jet printing apparatus 10 of the prior art is illustrated. The apparatus 10 includes a frame 11 having a substrate support plane 12 over which a substrate 15 is supported. The substrate 15 is illustrated as a web of material that is longitudinally fed from a roll supply 13 thereof, along the frame 11 and over the support plane 12, by one or more sets of feed rolls 14 that are mounted to rotate on the frame 11. A drive motor 16, which may be a servo drive motor, advances the substrate 15 past a bridge 17, which is fixed to the frame 11, and on which bridge is mounted a carriage 18 to move on the bridge 17 in a direction transverse to that of the feed. The carriage 18 has mounted thereon one or more ink-jet printheads 20, which it carries with it transversely across the frame 11. The carriage 18 is moved across the bridge 17 by a linear servo motor 19 carried by the bridge 17 and the carriage 18. The printheads 20 include nozzles (not shown), which are directed from the carriage 18 toward the support plane 12 so as to jet ink onto a substrate 15 when supported in the plane 12. A controller 25 operates the printheads to synchronize the jetting of the ink onto the substrate with the position of the printheads relative to the substrate in order to produce an image in accordance with a programmed pattern. The controller 25 also controls the motor 16 that moves the substrate 15 longitudinally relative to the frame 11 and the motor 21 that moves the carriage 18 transversely across the bridge 17.

[0016] The apparatus 10 is also provided with a decoder 26, which is mounted on the frame 11 at a point near the stationary bridge 17 and has a sensor wheel 27, approximately 6 inches in diameter, that engages the substrate 15 and produces a measurement signal in response to the movement of the substrate 15 relative to the bridge 17. This measurement signal is sent to the controller 25, which in response to the substrate feed measurement signal, sends a feed adjustment signal to the motor 16. The motor 16 makes a feed adjustment to the substrate 15. In the prior art, such adjustment has not been totally satisfactory in eliminating feed error artifacts.

[0017] In Fig. 2, a printing apparatus 30 according to an embodiment of the present invention is illustrated. The apparatus 30 has certain elements that are the same

as the elements of the apparatus 10 of Fig. 1, which elements are similarly numbered. In addition, the apparatus 30 includes a dual feed system of U.S. Patent No. 6,012,403 wherein the bridge 17 is mounted to move longitudinally on the frame 11. This movement is provided by linear servo motors 31 carried by the bridge 17 and the frame 11. A controller 35 is provided having the functions described for the controller 25 of the apparatus 10 above, with additional functions including the ability to control the motors 31 to move the bridge 17 relative to the frame 11 in a longitudinal direction. As such, the controller 35 can index the substrate 15 longitudinally relative to the printhead 20 by holding the bridge 17 stationary relative to the frame 11 and moving the substrate 15 longitudinally relative to the frame 11, or by holding the substrate 15 stationary relative to the frame 11 and moving the bridge 17 relative to the frame 11, or by a combination of the motions of the bridge 17 and the substrate 15 relative to the frame 11. Accordingly, the motors 16 and 31 can be energized alternatively or simultaneously by the controller 35.

[0018] Experience has shown that longitudinal indexing of the printhead 20 relative to the substrate 15 that is made with movement of the bridge 17 on the frame 11 by the motor 31 is far more accurate than indexing made with movement of the substrate 15 on the frame 11 by the motor 16. However, there are applications where feeding the substrate 15 over the frame 11 by activation of the motor 16 has advantages, particularly where large images are printed on a continuous substrate web.

[0019] According to the present invention, encoder 26 is mounted at a fixed point on the frame 11 near the normal resting place of the bridge 17 in apparatus 30. The controller 35 is programmed so that, when the substrate 15 is fed by activation of the motor 16, the motion of the substrate 15 is measured by the encoder 26, the controller 35 receives the measurement signal from the encoder 26, calculates any feed error, and sends a correction signal to the motor 31. In this way the motor 31 moves the bridge 17 to move the printhead 20 a longitudinal distance that compensates for any error in the feed of the substrate 15 by the motor 16. Such movement of the bridge 17 by the motor 31 can be carried out with accuracy, typically of the order of +/- 5 microns. As a result, feed correction can be precisely and quickly made during the time that the printhead carriage is reversing direction off to the side of the substrate 15 between printhead scans that result in the printing of rows of the image on the substrate 15.

[0020] Further according to the present invention, any error correction made by movement of the bridge 17 by the motor 31 is subtracted from the next indexing motion signaled by the controller 35 to the motor 16. For example, if a correction X is made by moving the bridge 17 that amount in the forward longitudinal direction, the next feed distance of the substrate 15 is reduced by the amount X . If the correction had been made in the reverse longitudinal direction, then X is added to the next feed distance of the substrate 15. This keeps the bridge 17 from progressively moving longitudinally along the frame 11 and eventually reaching the end of its travel.

[0021] Fig. 3 illustrates an ink-jet printing apparatus 40 according to another embodiment of the invention, in which the bridge 17 is stationary on the frame 11. In the apparatus 40, the printhead 20 is provided with a small amount of movement capability in the longitudinal direction on the carriage 18. This movement capability need be only a few thousandths of an inch. It can be implemented by providing a slidable mount 41 for the printhead 20 on the carriage 18 that provides a small amount of longitudinal printhead travel. A cam 42 may be provided for moving the printhead on this mount that is driven by a servo motor 43. In operation, the controller 35 sends the correction signal to the servo motor 43 in the same manner that it was sent to the servo 31 in the embodiment 30 above. This embodiment can be easily adapted to existing web-fed printing machines having fixed bridges.

[0022] The invention has been described in the context of exemplary embodiments. Those skilled in the art will appreciate that additions, deletions and modifications to the features described herein may be made without departing from the principles of the present invention. Accordingly, the following is claimed:

1. A method of precisely indexing a substrate relative to an ink jet printhead of an ink jet printing machine between printing scans of the printhead, comprising:
 - feeding the substrate by advancing the substrate relative to the printhead and the printing machine;
 - 5 measuring the distance moved by the substrate relative to the machine when the substrate is fed and calculating any error in the distance the substrate is fed; and
 - correcting for the error by adjusting the position of the printhead relative to the machine.
2. The method of claim 1 further comprising:
 - 10 further feeding the substrate by advancing the substrate relative to the printhead and the printing machine a feed distance modified by the calculated error.
3. A method of ink jet printing comprising:
 - ink jet printing, with a printhead at a printing station, a first row of an image transversely across a substrate that is stationary at a printing station;
 - 15 then, feeding the substrate longitudinally through the printing station in response to a feed signal from a controller that is representative of a given feed distance, and measuring the actual distance that the substrate moves longitudinally through the printing station when so fed;
 - then, calculating, as a correction distance, the difference between the given feed
 - 20 distance and the measured actual distance;
 - then, moving the printhead longitudinally the correction distance;
 - then, ink jet printing a second row of the image transversely across a substrate, when stationary at a printing station.
4. The method of claim 3 further comprising:
 - 25 further feeding the substrate longitudinally through the printing station in response to a feed signal from the controller that is representative of a given feed distance less the calculated correction distance.

5. The method of claim 3 further comprising:
moving the printhead longitudinally an adjusted distance that will bring the printhead
to a reference position relative to the machine;
further feeding the substrate longitudinally through the printing station in response
5 to a feed signal from the controller that is representative of a given feed distance
less the calculated correction distance and adjusted distance.
6. The method of any of the above method claims wherein:
the correction distance is positive when the given distance is greater than the
measured distance and is negative when the correction distance is less than the
10 measured distance.
7. The method of any of the above method claims wherein:
the ink jet printing is carried out with the printhead moving transversely across a
bridge and the printhead is moved longitudinally by moving the bridge relative
to the machine.
- 15 8. The method of any of the above method claims wherein:
the ink jet printing is carried out with the printhead moving transversely across a
bridge and the printhead is moved longitudinally by moving the printhead
relative to the bridge.
9. An ink jet printing apparatus having a controller configured to operate the apparatus
20 according to the method of any of the above claims.
10. An ink jet printing apparatus essentially as described in the specification.
11. An ink jet printing method essentially as described in the specification.
12. An ink jet printing apparatus having any of the elements described in the
specification.

13. An ink jet printing method having any of the steps described in the specification.

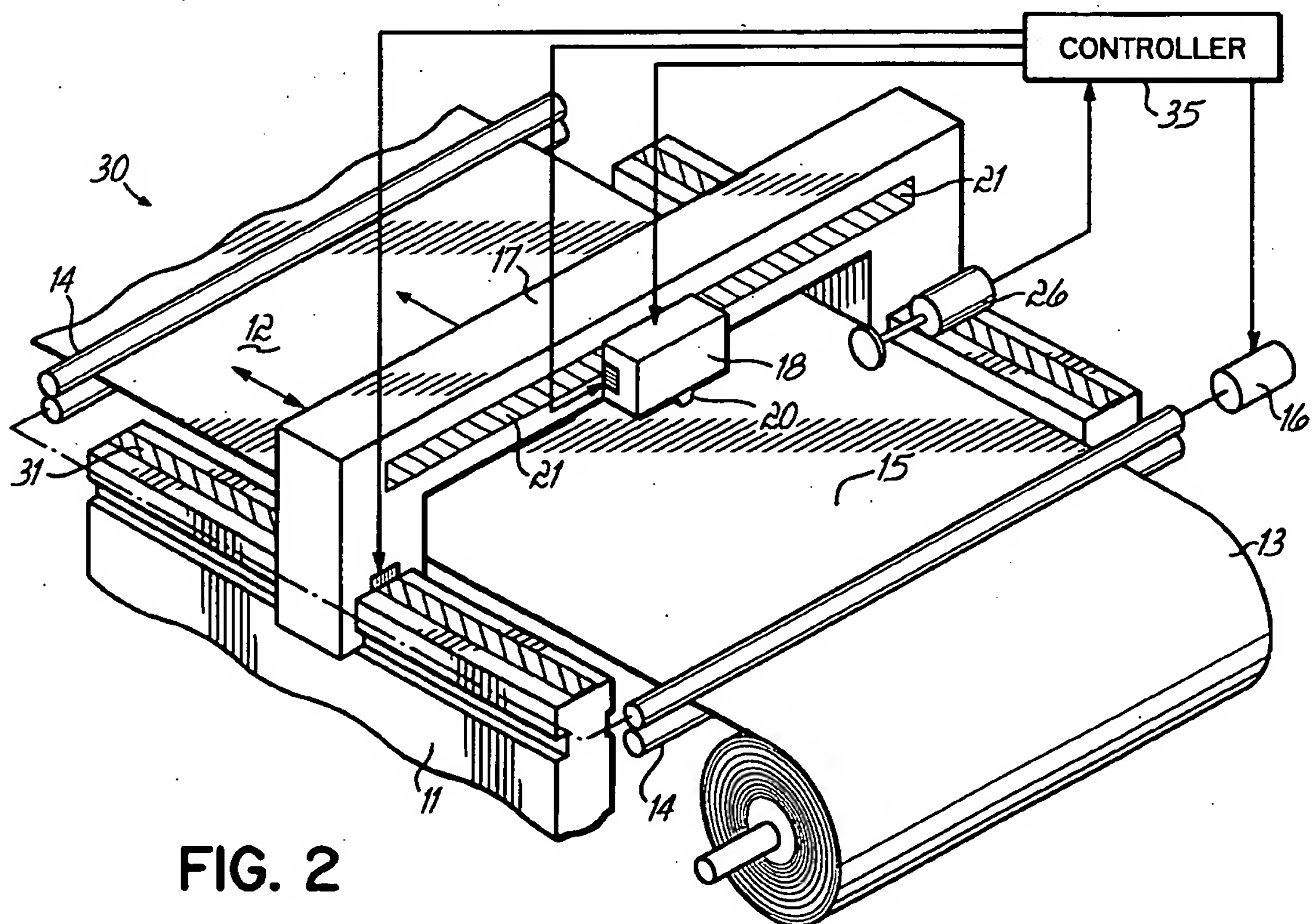
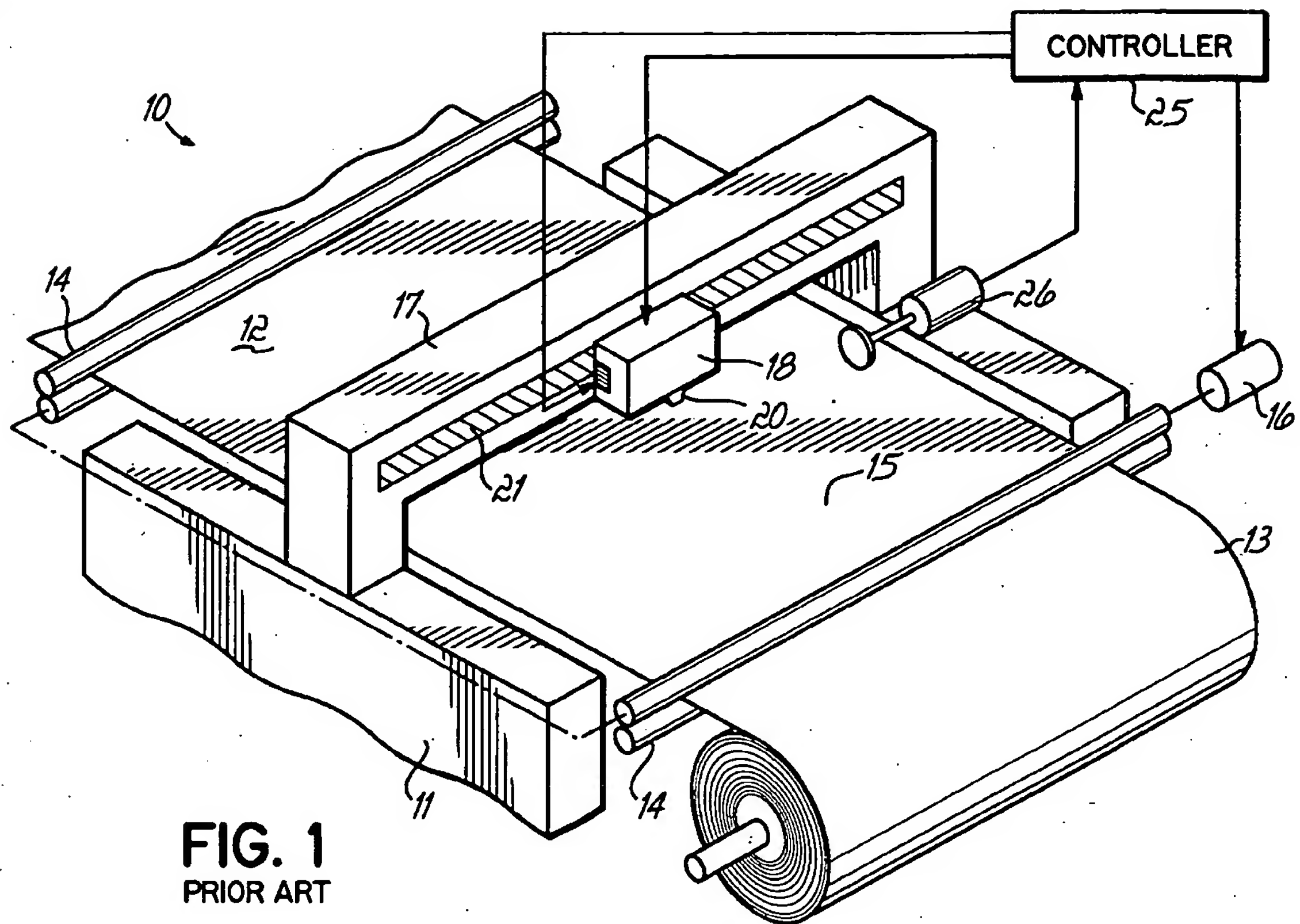
14. An ink jet printing apparatus having any of the elements incorporated by reference into the specification.

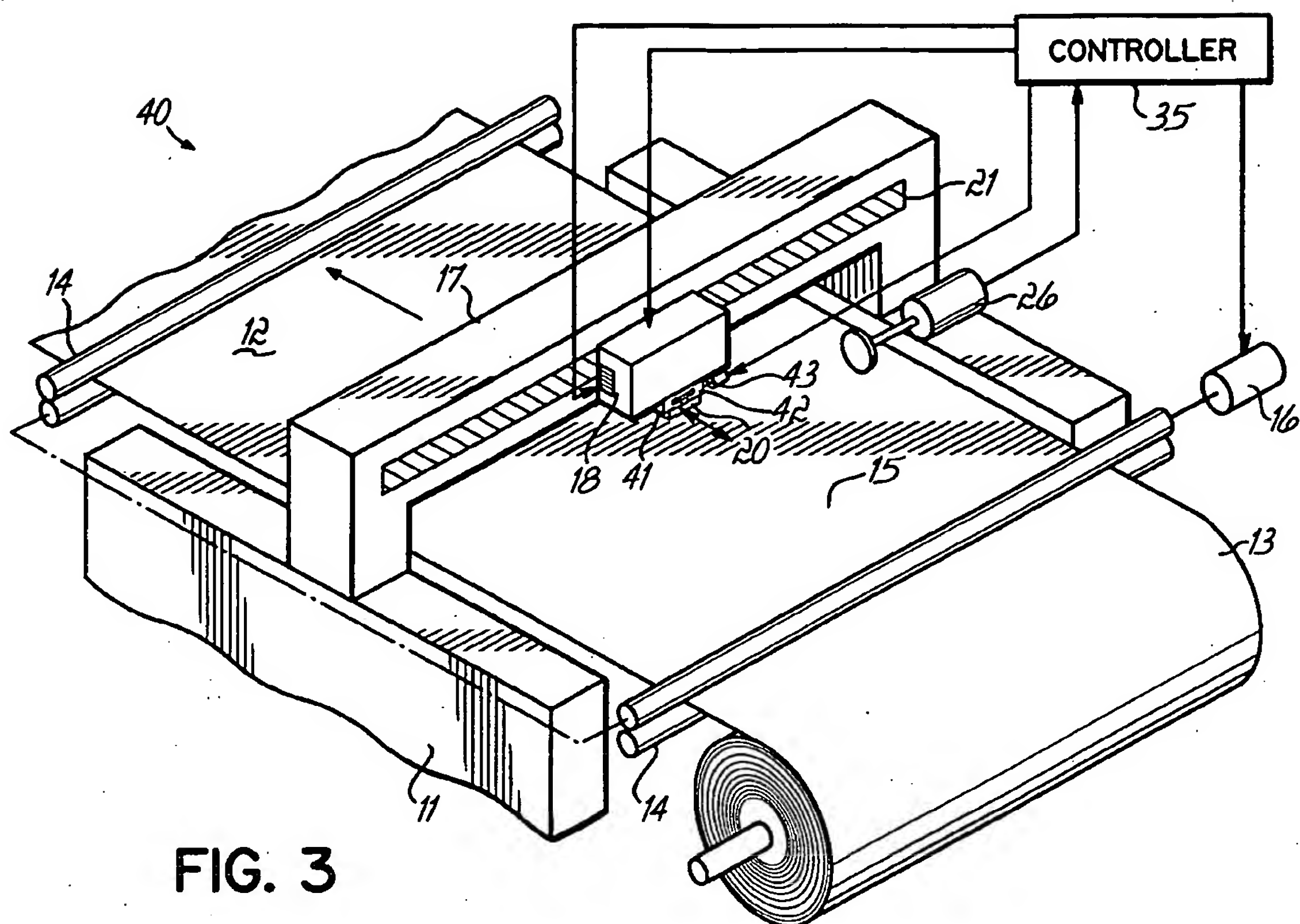
5 15. An ink jet printing method having any of the steps incorporated by reference into the specification.

**HIGH PRECISION FEED PARTICULARLY USEFUL FOR
UV INK JET PRINTING ON VINYL**

Abstract of the Disclosure:

5 An apparatus and method of ink jet printing is disclosed in which a printing
apparatus includes a system for feeding a substrate relative to a support area and a system
for moving a printhead parallel to the direction of feed. Precise indexing between
transverse scan rows of the printhead is achieved by feeding the substrate between print
rows initially by the substrate feed system, then measuring the actual feed distance using
10 an encoder and determining with a controller any error between the actual and the desired
feed distance, then moving the printhead with printhead moving system to compensate
for any error in the feed system feed. Adjustments are made to subsequent substrate
feeds and printhead moves to insure that the printhead does not move far from its zeroed
position due to cumulative movements. For printers that have bridges moveable relative
15 to the machine frame on which the printhead is carried, printhead motion is achieved by
moving the bridge. For fixed bridge roll-to-roll printers, the printhead can be shifted on
the bridge to make the correcting movements.





10/597546

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference LPPT-26PC	FOR FURTHER ACTION		See item 4 below
International application No. PCT/US2005/002539	International filing date (<i>day/month/year</i>) 28 January 2005 (28.01.2005)	Priority date (<i>day/month/year</i>) 30 January 2004 (30.01.2004)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant L & P PROPERTY MANAGEMENT COMPANY			

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input checked="" type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 31 July 2006 (31.07.2006)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt02@wipo.int

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

REC'D 02 MAR 2006

PCT WPO PCT

To:
JOSEPH R. JORDAN
WOOD, HERRON & EVANS, LLP
2700 CAREW TOWER
CINCINNATI, OH 45202

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing (day/month/year) 27 FEB 2006		
FOR FURTHER ACTION See paragraph 2 below		
Applicant's or agent's file reference LPPT-26PC		
International application No. PCT/US05/02539	International filing date (day/month/year) 28 January 2005 (28.01.2005)	Priority date (day/month/year)
International Patent Classification (IPC) or both national classification and IPC IPC(7): B41L 39/00; B41J 11/42 and US Cl.: 347/16, 19; 101/484, 483; 400/582		
Applicant CODOS RICHARD N.		

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Date of completion of this opinion 15 January 2006 (15.01.2006)	Authorized officer <i>Stephen D Meier for</i> STEPHEN D MEIER Telephone No. (571)272-1562
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Form PCT/ISA/237 (cover sheet) (April 2005)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US05/02539

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

- ☐ a sequence listing
- ☐ table(s) related to the sequence listing

b. format of material

- ☐ on paper
- ☐ in electronic form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/02539

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>12 and 14-16</u>	YES
	Claims <u>1-11, 13 and 17-19</u>	NO
Inventive step (IS)	Claims <u>1-11, 13, 17-19</u>	YES
	Claims <u>12 and 14-16</u>	NO
Industrial applicability (IA)	Claims <u>1-19</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and explanations:

1. Claims 1-11, 13, 17-19/13 lack an inventive step under PCT Article 33(3) as being obvious over Duchovne (US 6296403) in view of Walker et al. (US 6158344).
Duchovne discloses an ink jet printing apparatus comprising:
a frame (FIG. 4) and a bridge extending transversely across the frame and defining a printing apparatus (FIG. 4, element 60);
a motion system configured to move the printhead longitudinally relative to the frame and includes a linear servo (Fig. 4: Linear motor 54 moves the printhead 52 across the bridge 60);
a feed system configured to advance a substrate (FIG. 4-5, element 46) longitudinally through the printing station (FIG. 4, element 44);
a printhead moveable transversely across the bridge to print a row of the image across the substrate at the printing station (FIG. 4: The printhead 52 moves along the direction 57 to print a row on media 46);
a controller operable to activate the feed system to perform an indexing motion of the substrate longitudinally through the printing station (FG. 5);
Duchovne, however, does not disclose a web position measurement device operable to measure and communicate to the controller a signal corresponding to an actual distance moved by the substrate during the indexing motion and the controller being operable to activate the motion system to move the printhead longitudinally a distance corresponding to the difference (less than or greater than) between actual distance move by the substrate during the indexing motion and a predetermined distance, wherein the web position measurement device includes an encoder responsive to the motion of the substrate relative thereto and being fixed to the frame or the bridge.
Walker et al. discloses a method of calibrating a media advance mechanism in a printer including a media sensor, having an encoder fixed to a frame (FIG. 4, element 46), to measure and communicate to a controller a signal corresponding to an actual distance moved by the media during the indexing motion and the controller being operable to activate the motion system to move the printhead longitudinally a distance corresponding to the difference between actual distance move by the substrate during the indexing motion and a predetermined distance (FIG. 4, column 2, lines 40-45; column 4, lines 1-65; column 6, lines 40-47).
Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify Duchovne's printing apparatus to include the media advance sensor as suggested by Walker et al. The motivation of doing so would have been to be able to detect errors in media advance in order to calibrate the media advance mechanism as taught by Walker et al. (column 4, lines 50-65).
2. Claims 12, 16, 17/16, 18-19/17/16 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest wherein the controller is operable to activate the motion system to move the printhead longitudinally relative to the bridge to the distance corresponding to the difference between the actual distance and the predetermined distance.
3. Claims 14-15, 17/14-15, 18/14-15, 19/14-15 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest wherein the controller is operable to activate the motion system to move the bridge longitudinally relative to the frame to the distance corresponding to the difference between the actual distance and the predetermined distance.
4. Claims 1-19 meet the criteria set out in PCT Article 33(4), and thus the claims meet industrial applicability because the subject matter claimed can be made or used in industry.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US05/02539

Box No. VI Certain documents cited

1. Certain published documents (Rules 43bis.1 and 70.10)

Application No. <u>Patent No.</u>	Publication date <u>(day/month/year)</u>	Filing date <u>(day/month/year)</u>	Priority date (valid claim) <u>(day/month/year)</u>
US 6158344	12/12/2000	03/12/1998	
US 4485982	04/12/1984	24/11/2982	
US 4734868	29/03/1988	21/07/1986	
US 6454474	24/09/2002	14/11/2001	27/04/2000
US 6296403	02/10/2001	28/07/1999	

2. Non-written disclosures (Rules 43bis.1 and 70.9)

<u>Kind of non-written disclosure</u>	Date of non-written disclosure <u>(day/month/year)</u>	Date of written disclosure referring to non-written disclosure <u>(day/month/year)</u>
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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US05/02539

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 13 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 13 indefinite for the following reason(s): The claim recites the limitation "the printhead" on line 4 with insufficient antecedent basis.

10/597546

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PATENT COOPERATION TREATY

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PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

JORDAN, Joseph, R.
Wood, Herron & Evans, L.L.P.
2700 Carew Tower
Cincinnati, OH 45202
United States of America

Date of mailing (day/month/year) 10 August 2006 (10.08.2006)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference LPPT-26PC	
International application No. PCT/US2005/002539	International filing date (day/month/year) 28 January 2005 (28.01.2005)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address QUATTROCIOCCHI, Angelo 120 King High Drive Thornhill, Ontario L4J-3N4 Canada	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☐ the address ☒ the nationality ☒ the residence

Name and Address QUATTROCIOCCHI, Angelo 120 King High Drive Thornhill, Ontario L4J-3N4 Canada	State of Nationality CA	State of Residence CA
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

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21.08.2006

TEAM 14

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input checked="" type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 338.89.65	Authorized officer Anman QIU Telephone No. (41-22) 338 9098
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